

Remarks

I. Restriction and re-joinder

Claims 1-29 are pending in this application. The Examiner withdrew claims 26-29 from consideration, but indicated that claims 26-29 would be rejoined for examination as long as the technical features in the first group of claims is present in claims 26-29. Claims 26-29 depend either directly or indirectly from claim 1, so applicants believe that this condition will be met.

In maintaining the restriction requirement, the Examiner mentioned that the International Preliminary Examination Report found claims 1 and 26 to lack an inventive step over U.S. Patent No. 5,602,661. The Examiner further stated that "the officer who prepared the report did not require a lack of unity election even though he found a lack of unity invention." Applicants are confused by these comments and do not agree with them. Page 2 of the report explains that all of claims 1-29 involve an inventive step over the cited art, including U.S. Patent No. 5,602,661 discussed on the last page of the report. The first page of the report in item number 3 also provides an opportunity for the officer to raise a lack of unity of invention objection. The officer did not do so. These points aside, applicants acknowledge the Examiner's willingness to re-join claims 26-29 for examination when appropriate.

II. Rejections under 35 U.S.C. § 112, second paragraph

The Examiner rejected claims 1-25 under 35 U.S.C. § 112, second paragraph, as indefinite for a variety of reasons. For the Examiner's convenience, applicants address each of those concerns in the order and paragraph numbering presented in the Office Action.

a(i). The Examiner stated that the meaning of "polymerisable mixture" was unclear. The Examiner particularly questioned whether all of the components of the mixture must be polymerisable and whether "mixture" refers to the components blended together. Applicants respectfully traverse this rejection. Claim 1 recites a polymerizable mixture comprising clearly polymerizable component (i), which has a cross-linkable group, and component (ii), which is photo-orientable. The preamble of the claim recites a "polymerizable mixture" because at least component (i) is polymerizable. Any

additional components can be polymerizable, but they are not required to be so. For example, claim 7 specifies as an option that component (ii) may be a photopolymerisable monomer or oligomer or polymer. It is therefore not necessary that all components of the mixture of claim 1 be polymerizable. If a mixture of two individual components is provided, one of which is polymerizable while the other one may or may not be polymerizable, the mixture can clearly and without ambiguity be described as a polymerizable mixture. The term "mixture" is understood as a blend of at least two individual components as shown, for example, in Example 1 of the specification. Applicants also attach a copy of an excerpt from the American Heritage dictionary of the English language, fourth edition, indicating the chemical interpretation of the term mixture and stating that the terms "mixture" and "blend" are synonymous.

(a)(ii). The Examiner stated that it was not clear how the terms "monomer" and "prepolymer" differed from each other. Applicants respectfully traverse this rejection. The difference between a monomer and a prepolymer is clearly defined in chemistry and in this particular technical field. In this regard, applicants provide below the IUPAC (International Union of Pure and Applied Chemistry) definitions of these two terms:

1.11 pre-polymer molecule

A macromolecule (see Definition 1.1) or oligomer molecule (see Definition 1.2) capable of entering, through reactive groups, into further polymerization (See Definition 3.1), thereby contributing more than one monomeric unit (see Definition 1.8) to at least one chain of the final macromolecule.

1.3 monomer molecule

A molecule which can undergo polymerization (see Definition 3.1), thereby contributing constitutional units (see Definition 1.14) to the essential structure of a macromolecule (see Definition 1.1).

See IUPAC-Definition according to "Glossary of basic terms in polymer science" (IUPAC Recommendations 1996), Pure Appl. Chem., Vol. 68, No. 12, pp. 2287-2311 (1996); <http://www.iupac.org/reports/1996/6812jenkins/substances.html>.

(a)(iii). The third comment regarding claim 1 mentions that it is unclear whether the liquid crystal monomer, oligomer or polymer is a different compound from the photo-orientable monomer. Claim 1 recites (i) a liquid crystal monomer or pre-polymer having cross-linkable groups and (ii) a photo-orientable monomer or oligomer or polymer.

Components (i) and (ii) are separate components. Applicants have amended claim 1 to recite a "polymerisable mixture comprising at least the following two components" to make this even more clear. Support for this amendment appears throughout the specification, including at page 4, line 17, which discloses "varying the types and proportions of the various chemical components of the mixture is according to the invention as a useful tool" This amendment does not narrow the scope of the claim.

(a)(iv). The last point raised for claim 1 was that the term "photo-orientable" was unclear. Applicants respectfully traverse this rejection. The term "photo-orientable" is not unclear, especially in the context of the present invention. The specification defines the term photo-orientable on page 4, lines 22-24, as meaning "capable of developing a preferred direction when irradiated with linearly polarised light." The meaning of "photo-orientable" is clear and understood by those skilled in the art and therefore should not render claim 1 indefinite.

(b). The Examiner rejected claims 2-11 for lack of an antecedent basis for the term "substance" in claim 1. Applicants mentioned above that the preamble of claim 1 was amended to recite a polymerisable mixture comprising at least two "components." Applicants have therefore amended claims 2-11 to refer to a "component," rather than "substance," in claim 1. Although claim 26 has been withdrawn from consideration, applicants amended that claim as well to recite a "component" rather than "substance." These amendments should address the Examiner's concern but do not limit the scope of the claims.

(c). Claims 2-4 were rejected for reciting "parts" without explicit reference to "parts by weight." Applicants have amended the claims to refer to parts by weight. Support for these amendments appears in the examples of the specification, which provide parts by weight. These amendments do not narrow the scope of the claims.

(d). Original claim 6 recited that the photo-orientable component (ii) comprises azo dyes. The Examiner asked whether that phrase means that the substance comprises a compound belonging to the group of azo dyes. Applicants confirm that the Examiner's understanding is correct, and claim 6 has been amended to make that clear. This amendment does not narrow the scope of the claims.

(e). The Examiner rejected claim 17 in its use of the term "presensitized film precursor." Applicants respectfully traverse this rejection. The specification on page 5, lines 25-27, describes a presensitized film precursor comprising a substrate carrying a layer of a mixture according to the invention. The term "presensitized" signifies that the film may undergo transformation upon, for example, irradiation with light. The term "film precursor" signifies that the film may not yet completely fulfill its destined function but can be treated or modified to do so. The rejected term is quite common in this field of technology, is understood by those skilled in the art, and therefore should not render claim 17 indefinite.

(f). The Examiner rejected claim 22 for its use of the phrase "locally varying preferred orientation directions." Applicants respectfully traverse this rejection. That phrase means that the polymer film is structured, i.e., that the film comprises different areas that can induce different orientation of the liquid crystal molecules. Such a film is disclosed, for instance, in Example 7 of the specification. Since this phrase is clear, applicants respectfully request that the Examiner withdraw this rejection.

(g). For claim 25, the Examiner stated that it was unclear whether the recited layer had a function of an orientation layer and another function as a retarder, an optical filter, a polarizer or a polarized light emitter. Applicants have amended claim 25 to make clear that the layer does have the function of an orientation layer as well as one or more of the other recited functions.

(h). Lastly, claims 17-18 were rejected as being unclear as to whether the layer of the mixture of claim 1 is in contact with the substrate. Applicants respectfully traverse this rejection. To use claim 17 as an example, the claim recites a presensitized film precursor comprising a substrate "carrying" a layer of a mixture according to Claim 1. The substrate provides a supporting structure to any layers applied to it. The term "carrying" conveys that the mixture of claim 1 may be applied directly onto the substrate surface or, alternatively, one or more intermediate layers may be applied to the substrate surface between the substrate and the layer of the mixture of claim 1. In either sense, the substrate "carries" the layer of the recited mixture. In view of this explanation, applicants respectfully request that the Examiner withdraw this rejection.

III. Rejections under 35 U.S.C. § 102

The Examiner rejected claims 1-5, 7, 11-13 and 15-18 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,696,990 to Noonan et al. ("Noonan"). In support of the rejection, the Examiner referred to, among other things, the disclosure at cols. 5-6. Applicants respectfully traverse this rejection as it relates to claim 1. The other rejected claims depend from claim 1 and should be patentable for the same reasons.

Noonan discloses photocrosslinkable liquid crystalline polymers. Noonan at col. 1, lines 6-9. Those polymers can comprise, among other things, a group that provides "stiffening and rod-like characteristics" as well as cinnamoyl group. The photocrosslinkable liquid crystalline polymers do not teach or suggest a polymerisable mixture comprising two components being (i) a liquid crystal monomer or pre-polymer having cross-linkable groups; and (ii) a photo-orientable monomer or oligomer or polymer. This is because disclosed polymers of Noonan are single entities that can be both liquid crystalline and photo-orientable, and they are not a mixture of separate components as claimed.

For the Examiner's convenience, applicants enclose an attachment illustrating the steps 1-5 of the disclosed synthesis in Example 1 of Noonan. Step 1 of the synthesis prepares 6-hydroxyhexyl methacrylate. Step 2 prepares 4-methoxycinnamoyl chloride. As stated in the Noonan patent at col. 5, lines 65-68, step 3 illustrates the addition of an aryl group to the compound of step 2 to increase the stiffness and rod-like characteristics of the alkyl or alkoxy substituted cinnamoyl group. The disclosed reactants of that step do not teach or suggest the claimed mixture and the final product does not teach or suggest the claimed mixture. Step 4 illustrates the addition of a polymerizable group and remainder of a spacer group to the compound of step 3. Again, the combination of reactants of that step do not teach or suggest the claimed mixture and the final product does not teach or suggest the claimed mixture. For at least the reasons provided above, the claimed invention should be patentable over the Noonan disclosure.

Claims 1-4, 7-14 and 17-25 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,602,661 to Schadt et al. ("Schadt"). In support of the rejection, the Examiner stated that Schadt teaches a polymerizable mixture of cross-

linkable liquid crystal monomer which has acrylate or diacrylate components with a photo-orientable polymer PPN to form a hybrid layer which is optically anisotropic. Applicants respectfully traverse this rejection as it relates to claim 1. The other rejected claims depend from claim 1 and should be patentable for the same reasons.

As mentioned in the Schadt patent at col. 1, lines 58-64, the disclosure relates to an orientation layer comprising a photo-orientable polymer network (PPN) that orients liquid crystal monomers present in a separate layer. The photo-orientable polymer is explicitly disclosed as being in a layer separate from the liquid crystal monomers, not as being in a mixture with liquid crystal monomers. The international preliminary examination report (see in particular 3.1 of the report) also mentions the use of a separate layer for the photo-orientable component in the Schadt document, not mixtures of components (i) and (ii) as claimed. The Schadt patent thus does not teach or suggestion the claimed invention, and applicants respectfully request that the Examiner withdraw this rejection.

IV. Rejection under 35 U.S.C. § 103(a)

Claims 6 and 15 were rejected under 35 U.S.C. § 103(a) as unpatentable over Schadt in view of U.S. Patent No. 5,589,237 to Akashi et al. ("Akashi"). The Examiner relied on Schadt as a primary reference for the teaching of a mixture of components (i) and (ii) as claimed, and concluded that it would have been obvious to incorporate the teachings of Akashi relating to dyes and fluorescent molecules to make the inventions of claims 6 and 15.

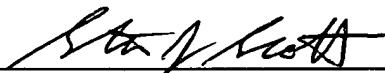
The remarks above establish that the invention of claim 1 would not have been obvious in view of Schadt. Claims 6 and 15, which depend either directly or indirectly from claim 1, should be patentable over Schadt for the same reasons. Teachings of Akashi relating to dyes and fluorescent molecules do not provide the suggestion of the mixture of components (i) and (ii) as claimed, and thus do not render claim 1, 6 or 15 obvious even if they could be combined with the Schadt disclosure.

In view of the amendments and remarks above, the pending claims should satisfy the requirements of 35 U.S.C. § 112 and should be patentable over the cited documents. Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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By: 
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mixture

SYLLABICATION: mix-ture

PRONUNCIATION:  m ĭ ks ' ch ər

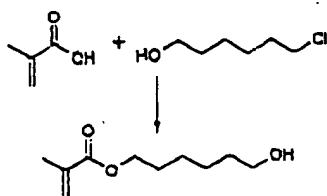
NOUN: 1a. The act or process of mixing: *an alloy made from the mixture of two metals.* b. The condition of being mixed: *the inevitable mixtures of urban neighborhoods.* 2. Something produced by mixing. 3. One that consists of diverse elements: *The day was a mixture of sun and clouds.* 4. A fabric made of different kinds of thread or yarn. 5. Chemistry A composition of two or more substances that are not chemically combined with each other and are capable of being separated.

ETYMOLOGY: Middle English, from Old French, from Latin *mixtūra*, from *mixtus*, past participle of *miscēre*, to mix. See *mix-* in Appendix I.

SYNONYMS: *mixture, blend, amalgam, admixture, compound*¹, *composite* These nouns refer to a combination produced by mixing. *Mixture* has the widest application: *She routinely drank a mixture of tea and honey.* "He showed a curious mixture of eagerness and terror" (Francis Parkman). *Blend* and *amalgam* imply that the original components have lost their distinctness: *The novel is a fascinating blend of romance and realism.* *The comedian's act was an amalgam of incisive wit and unceasing good humor.* *Admixture* suggests that one of the components is dissimilar to the others: *a perfume containing an essential oil with a large admixture of alcohol.* A *compound* constitutes a new and independent entity: *The school's program is a compound of scholarship and athleticism.* A *composite* has components that may retain part of their identities: *a musical suite that is a composite of operatic themes.*

Example 1, Noonan et al (US 4,696,990)

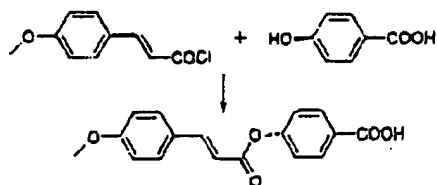
Step 1:



Step 2:



Step 3:



Step 4:

